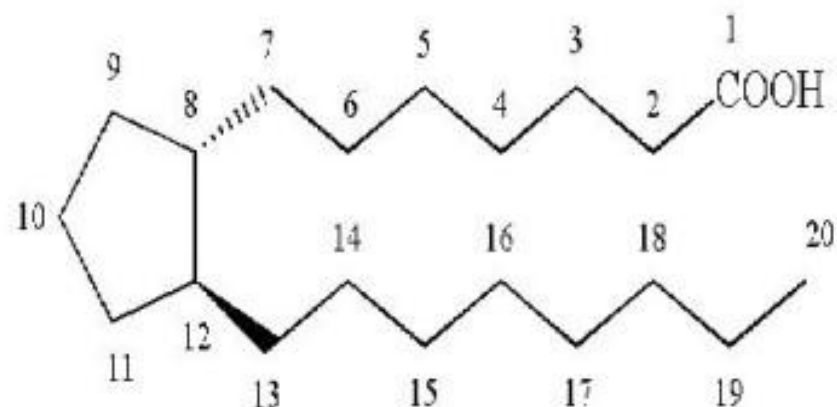


LIPID CHEMISTRY MIND MAPS



Prostanoic acid



2010

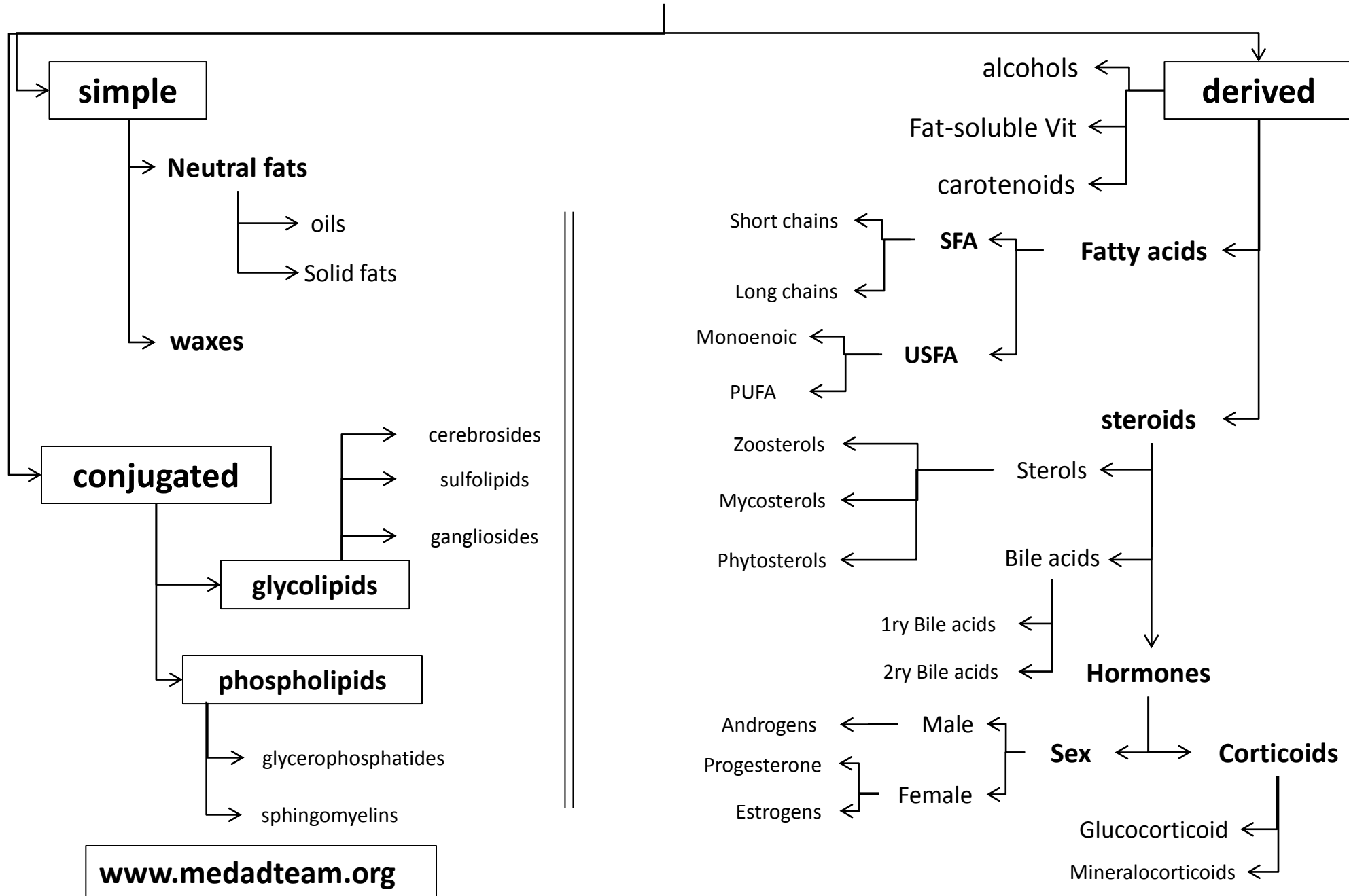
0.50 L.E



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NMT 14

Lipids



Fatty acids(FA):
1. (SFA): no(c=c)
2. (USFA): with(c=c)
More details in
derived lipids

Neutral FA

1/Simple lipids

Waxes

- Long chain FA + long chain monohydroxy alcohol
 - Bee's Wax by Myricyl alcohol C₃₀ esters
 - Lanolin (fur of animals) by Cholesterol derivatives esters
 - Vita A,D esters

Oils

- ↑↑ USFA
- ↓↓ melting point
- Liquid
- E.g. Corn, Cottonseed & Soybean oils

Solid Fats

- ↑↑ SFA
- ↑↑ melting point
- Solid
- E.g. Margarine & butter

physical prop.

- Colorless, Odorless, Tasteless
- pigments (carotenoids) → yellow color in fats & oils
- Non-polar
 - Insoluble in H₂O
 - Soluble in fat solvents

Chemical prop.

→ **Rancidity:** Bad Flavor (odor + taste) of fats or oils due to exposure to O₂, moisture, ↑ temp.

→ **Hardening (hydrogenation):**
Oil (c=c)+2H → fat (c-c)

→ **Hydrolysis by acids**

→ **Saponification**

→ **Iodine Num:** Num. of I₂ g absorbed by 100g of oil or fat
• I₂ Num. ↑↑ in oil because of ↑↑ USFA

Hydrolytic

Due to Moisture(H₂O)+Bacteria containing lipase → short chain FA
Releasing of short chain FA by lipase → bad flavor

Oxidative

Oils easier to rancid due to ↑↑ USFA (c=c)
* antioxidants e.g. (vit. E & Phenols)
Protects USFA by ↓↓ rate of rancidity

Phospholipids

glycerol phosphatides

- 1/ **lecithin** (phosphatidic acid + choline)
- 2/ **cephalin** (phosphatidic acid + ethanolamine)
- 3/ phosphatidyl -serine (phosphatidic acid + serine)
- 4/ phosphatidyl - inositol (phosphatidic acid + inositol)
- 5/ plasmalogens
- 6/ cardiolipins

sphingomyelin

- *present in cell membranes of lungs & brain (as myelin sheath)
- *FA linked to sphingosine by amide bond >> ceramide

***ceramide (sphingosine + FA) + phosphocholine = sphingomyelin**

1/ amphipathic molecules 2/ emulsifying factor

3/ hydrotropic substance 4/ cell membrane lipoproteins

5/ plasma lipoproteins

6/ lung surfactant (↓ lead to respiratory distress syndrome)

7/ synthesis of eicosanoids (provide arachidonic acid)

8/ blood clotting (provide PAT)

9/ mediate Hr actions (as activation of phospholipase C that act as 2nd Hr messengers)

importance of phospholipids

2/ conjugated

(esters of: fatty acid + alcohol + other group)

glycolipids

(ceramide + CHO)

importance of glycolipids

- 1/ myelin sheath
- 2/ red cel membrane
- 3/ plasma membrane

cerebrosides

- *contain glucose or galactose
- *all contain C24 fatty acid as nervonic acid

sulfolipids

- *sulfate - C3 of galactose

gangliosides

- 1/ ceramide
- 2/ sphingomyelin
- 3/ all glycolipids

- 1/ all glycolipids
- 2/ sphingomyelin

***sphingosine** containing compounds

***ceramide** containing compounds

***cholin** containing compounds

- 1/ lecithin
- 2/ lysoleciyhin
- 3/ lung surfactant
- 4/ sphingomyelin

3/Derived

Fatty Acids

Alcohols

- Glycerol
- Sphingosine
- Sterols
- Vit. A & D
- Long Chain monohydroxyl in waxes e.g. Mericyl alcohol

Carotenoids

- Pigment yellow to red
- In plants e.g. carrot, tomato
- In egg yolk, milk, human

Four types:

- β carotene (2 Vit. A) due to presence of 2 β Inone ring
- α carotene (1 Vit. A)
- γ carotene (1 Vit. A)
- cryptoxanthine (1 Vit. A)

Fat soluble Vit (A,K,E,D)

steroids

SFA (NO C=C)

Short chain (C2 – C10)

- C2: Acetic acid
- C4: Butyric acid

Long chain (\uparrow C10)

- C16: Palmitic acid
- C18: Stearic acid
- C24: Lignoceric acid

USFA

PUFA (>1 C=C)

Monoenoic (1 C=C)

- Palmitoleic (16:1, ω 7)
- Oleic (18:1, ω 9)
- Nervonic (24:1, ω 9)

ω 3

- α -Linolenic (18:3) (triethenoid)
- Timnodonic (20:5)

ω 6

- Linoleic (18:2)
- Arachidonic (20:4) (precursor of eicosanoids)
- γ -Linolenic (18:3)

Eicosanoids = C₂₀ hormones derived from arachidonic acid

Common features of cyclic group: Has **Cyclopentane** ring (R₁&R₂) at C₈&C₁₂ / 2 (OH) at C₁₁&C₁₅

group		e.g.	Special features	Site	Function
Cyclic compounds (Prostanoids)	Prostaglandins(PG) [derivatives of Prostanoid acid]	PGE ₂	has (=O) at C ₉	Most cells	<ul style="list-style-type: none"> • Vasodilatation • smooth muscle relaxation
		PGF α	has (OH) at C ₉	Most cells	<ul style="list-style-type: none"> • Vasoconstriction • smooth muscle contraction
	Thromboxanes(TX)	TXA ₂	Contain oxane ring	platelets	<ul style="list-style-type: none"> • platelet aggregation • vasoconstriction
	Prostacyclins(PGI)	PGI ₂	Contain additional ring	Endothelium	<ul style="list-style-type: none"> • $\downarrow \downarrow$ platelet aggregation
Acyclic compounds	Leukotrienes(LT)	LTA ₄	-----	<ul style="list-style-type: none"> • Leukocytes • Platelets • Mast Cells 	<ul style="list-style-type: none"> • Allergic reactions • $\uparrow \uparrow$ vascular permeability
	Lipoxins(LX)	LXA ₄	-----	Arterial walls	<ul style="list-style-type: none"> • Anti-inflammatory

Essential FA

- Not formed in the animal body
- Must be taken in diet

They are:

- α -Linolenic
- Linoleic

Deficiency leads to:

- Fatty liver
- Sterility
- Dermatitis
- Impaired growth
- Microcytic anemia



Physical prop. of FA

1. Melting point:

- $\downarrow \downarrow$ M.P. by
- $\downarrow \downarrow$ (C) atoms
- $\uparrow \uparrow$ cis [C=C]
- & vice versa

2. Solubility in water: \downarrow C₆ soluble

Chemical prop. of FA

1. Ester formation

Glycerol + 3FA \rightarrow TAG

2. Salt formation

3. Reduction

4. Prop. of USFA

- Addition of I₂
- addition of O₂
- Addition of H₂ (reduction)
 - C16: Palmitoleic \rightarrow Palmitic
 - C18: Oleic, Linoleic, α -Linolenic \rightarrow Stearic
 - C20: Arachidonic, Temnodonic \rightarrow Arachidic
 - C24: Nervonic \rightarrow Lignoceric

